Economic potential ans limitations of REDD and other international mitigation tools : an international perspective

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Abstract

This paper introduces the global trends of the world timber economics, the patterns of the international trade, and how economic projections show a growing tension between the needs and the existing natural resources. The principles of REDD and other economic tools intended to mitigate climate change are analyzed with an economic perspective. The relevant economic parameters of the international trade, of production and conservation of tropical forests are discussed. Implications for the feasibility of REDD and other mitigation tools are analyzed according to the nature of the international funds, and to the variability of the different countries. A temptative typology is proposed, on how the different strategies of valorization can be implemented. As a conclusion, the paper put the REDD and the other mitigation tools in perspective with the global trends imposed by the growth of China, India, and Brazil.

Introduction : global trends

REDD, acronym standing for “Reducing Emissions from Deforestation and Forest Degradation” is a global market tool. It aims to mitigate the effects of climate change, by promoting the reduction or carbon emissions (Seymour et al., 2008; Roda & Guizol, 2009). REDD is a market tool since this mechanism relies on the global market to buy “green” shares or carbon credits, which revenues would help to prevent deforestation of degradation, and consequently to prevent carbon emission, within given and eligible forest areas. As the other market tools involved in the forest sector, such as ecocertification mechanisms, boycotts, bilateral agreements (i.e. FLEGT), this specific tool is driven by the market forces which govern the global forest sector. What are the main components of these forces?

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In the context of the tropical forests, which especially interest Malaysian stakeholders, the most influential forces acting in the global sector are the development dynamics of Brazil, India, China, and secondarily of Indonesia. These forces are the growing demand of the middle-classes in these countries, and their growing consumption of relatively cheap tropical wood. The three first listed countries account now for 50% of the yearly tropical timber products consumption (in volume, see figure 1), while the western countries consumption has dropped below 6% of the yearly consumption. The pertinence of using the consumption by the western countries as a proxy of the leverage power of “ecosensitive” markets on the global economics of tropical forests is debatable. It is also possible to use a conservative proxy, the consumption of Brazil, India, China, which conversely underlines the pressure on the tropical forests by “non-ecosensitive” markets. Using this last proxy, and the next 20 years available projections of the global standing offer of tropical timber and of the consumption by Brazil, India, and China, we see that there will be less and less room for effective economic levers (see figure 2) in order to counterbalance the growing pressure on the forests. Thus, how can REDD and other mitigation tools be effective, in this context? The following parts of this papers aim to draw the potentialities and the limitations of their economic feasibility and leverage effect.

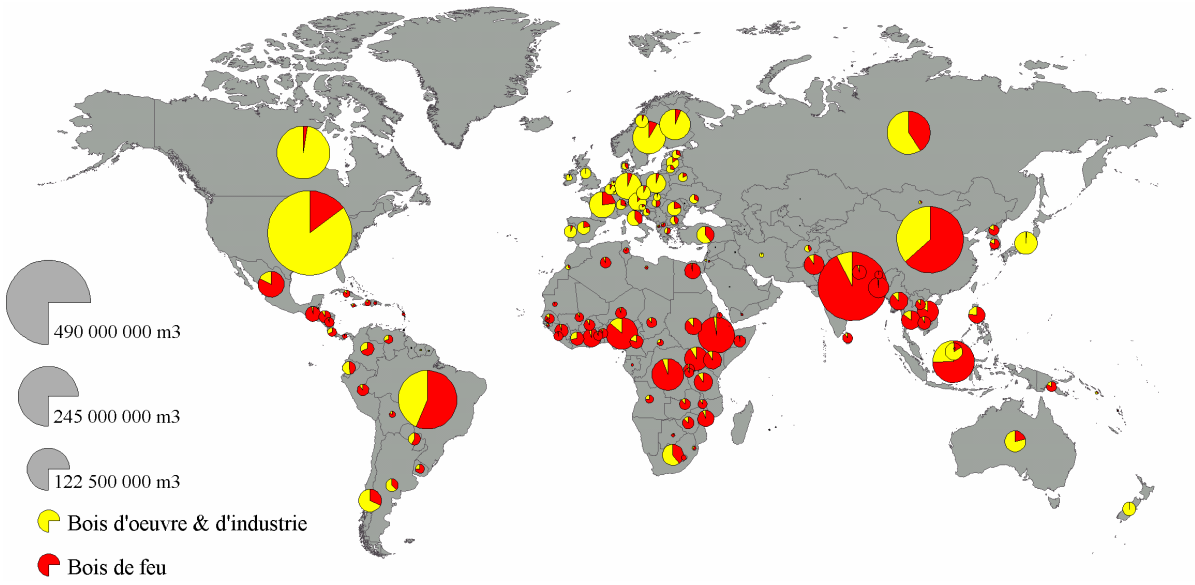

Figure 1: The world consumption of wood

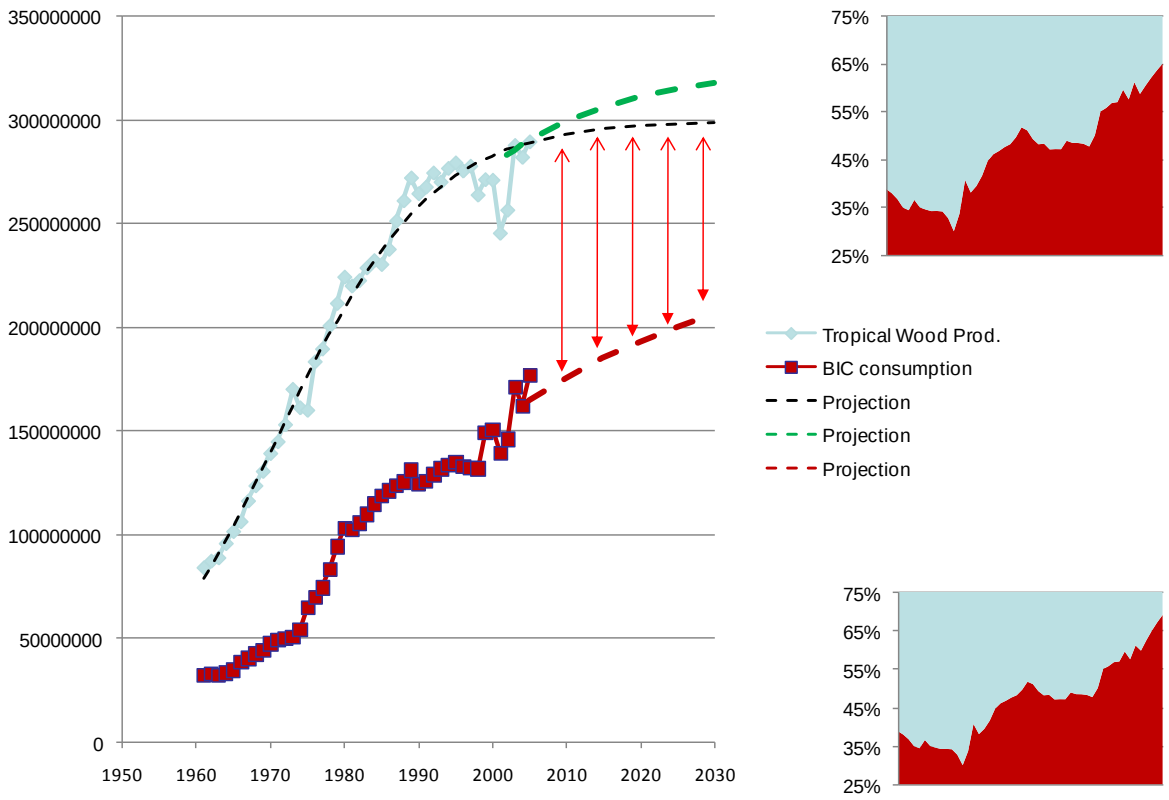

Figure 2: Between the world offer of tropical timber (FAO projections) and the Brazil, India China demand (CIRAD projections) : a reducing margin of action. (volume)

Economic parameters of international trade, production, and forest conservation

The main parameters of international trade, production and conservation of tropical forests can be grouped into two broad categories, namely the “extraction costs” which govern either the conversion of forest areas into other land uses, and the “profit limits” which explain the choices and strategies of the local and international actors. These broad categories cover many kinds of parameters, and the interactions of these parameters may differ greatly between the countries, or between the parts of one country. Table 1 summarizes the most influential economic parameters according to the two categories.

Table 1: Most influential parameters of the international trade, production, and conservation of tropical forests.

Extraction costs	Profit limits
International and domestic interactions of:	International and domestic interactions of:
- **Natural factors influencing the logistics (distance, transport costs, geographical or physical**	- Nature of the forests and of the most profitable forest products (timber, firewood, non wood

barriers…) - **Infrastructures** - **Energy and oil costs** - **Demographics (pools of demand, of workforce, and of skills)** - **Political and institutional stability** - **Nature of the forest and of their products**	products, etc.) - Market prices - Demographic pressure (pool of demand, pool of workforce) - Governance, stability, social parameters - Opportunity costs of the deferent possible land uses

Of course all of these parameters are very much influenced by the international factors and by the local and regional factors. They influence each other as well. This leads to a variety of forest contexts at the global scale, and one should be very cautious before any overgeneralization. We will see the different possible mixes of these parameters lead to very different feasibility contexts of tools such as the REDD mechanism. All these parameters lead to an economic equilibrium where the potential area for an “untouched forest” (that is to say the forest stock, and the carbon stock)), is delimited by the intersection of the economic curve of extraction costs, with the profit limit of the land use (forest products production, or any other alternative use). Figure 3 represents this economic equilibrium, where we see that distances constitute the driving factor of the extraction costs, in the context of tropical forests.

The general discourse about tropical forests and forest products usually assumes a hierarchy of profitability limits for the major products as the non wood products, the firewood, the timber for domestic markets, and the timber for international timber, from the least profitable to the most profitable. Such a gradation actually describes a typical production system based on humid tropical forests and hardwoods with international markets. But the variety of local contexts witnessed in the tropical forests of the world, introduce quantities of variants, beginning with the cases where the substitution of the land use to a non forest use such as palm oil, or cattle ranching. In this case, the profit limit of the substitution pushes upwards the economic equilibrium, reducing the potential for forest stock and carbon stock (figure 3). Conversely, some cases completely put upside down this gradation: in tropical dry forests (i.e. Sahel countries) there are barely international markets for the locally produced timber. Because of ecological conditions and scarcity, the timber is mainly for domestic markets, and even though, is often more a byproduct of the firewood rather than a very profitable main product. In these cases as well, land use substitution and associated opportunity costs can challenge the whole equilibrium. Without to list an extensive compendium of all the possible cases, these few examples are sufficient to illustrate the considerable variation of the possible economic equilibriums. This also suggests the fact that REDD and similar tools, as global mechanisms, face a variety of drastically different local situations.

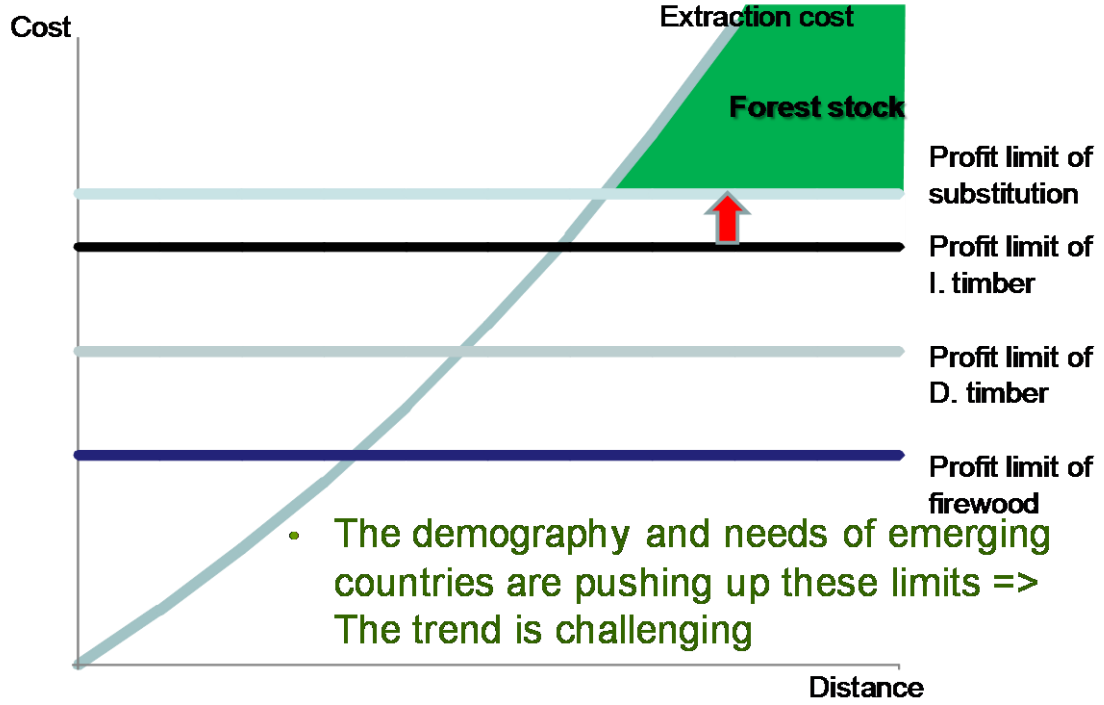

Figure 3: Economic equilibrium between production and conservation parameters, setting up the potential for forest stock

Implications for REDD, mitigation, and adaptation scenarios

What is the difference between mitigation and adaptation mechanisms? Basically, mitigation tools try to mitigate the climate change. They are designed in order to limit of even to reduce the emissions of greenhouse effect gases (GHGs). REDD and carbon credits market are such mechanisms. Conversely, adaptation tools don't mitigate the climate change. They are designed to limit or to reduce the vulnerability of poor and/or local populations regarding the consequences of climate change.

As we have seen, the global economics impose a trend of increased demand for tropical wood through the dynamics of Brazil, India, and China. This, plus the demographics of the various developing countries, translates into an increased global pressure on most of the tropical forests. Consequently, in most of the tropical forests, the economic equilibrium is degrading: the various profit limits already illustrated in figure 3 follow a trend which make them moving upward[3], reducing the potential for forest stock and forest carbon.

The very nature of international funds for mitigation is then to prevent further degradation of the equilibrium by obviating these profit limits to continue to move up.

[3] This upward trend doesn't mean that the discussed uses are becoming more profitable than before, but rather than the conditions of what the actors consider as "non profitable", change gradually.

Ideally, it is also about improving the equilibrium by moving the profits limits down, in order to increase the forest stock and carbon stock (figure 4). The adaptations scenarios are themselves more neutral. They do not intend to modify the economic equilibrium *per se*, nor its evolution. They essentially aim to build safety nets for the populations who suffer the most from the consequences of the climate change. As such they can have marginal repercussions on the discussed economic equilibrium. Given the context, these repercussions can contribute to increase the stock or to decrease it.

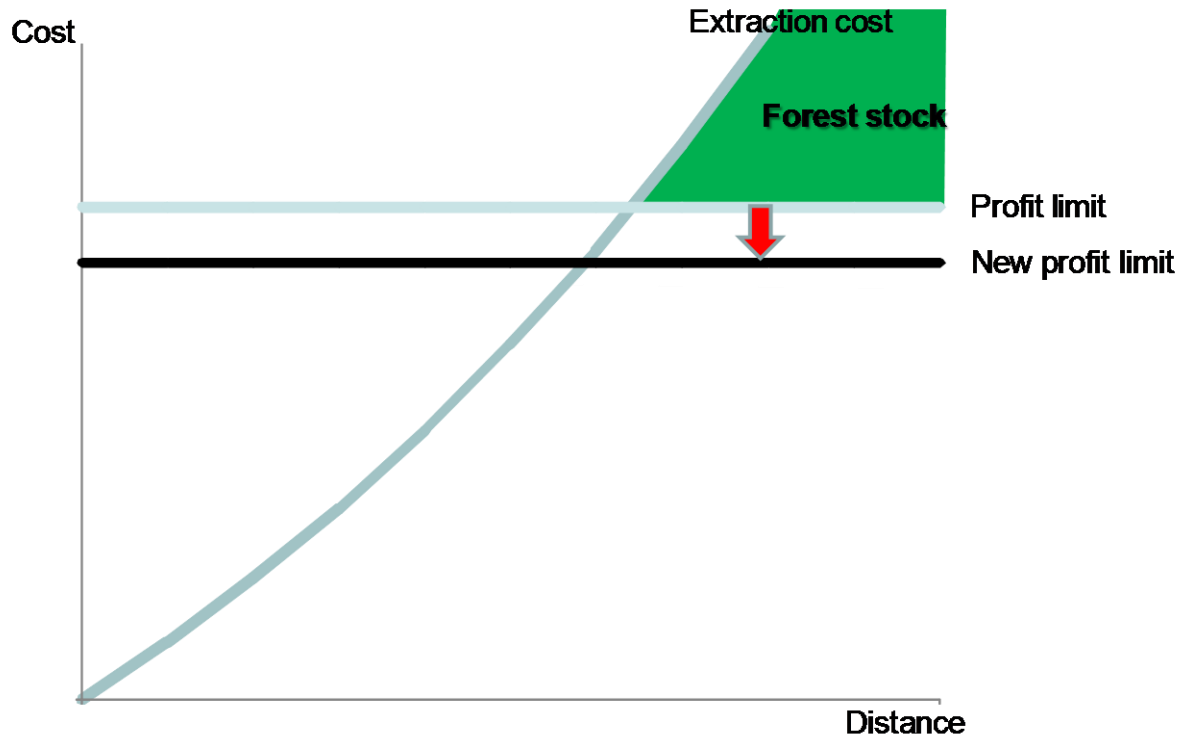

Figure 4: How the international funds for mitigation and adaptation can influence the economic equilibrium of forest stock

How national and local variations act on the economic equilibrium

The variations of the local and national contexts have a lot of influences on the economic equilibrium. We have seen in Table 1 a few examples of the factors that may vary greatly from place to place, leading to different “profit limits”. The local and national variations move up and down these limits. Compared to the typical example illustrated in figure 3 where, regarding classical forest products, there is a gradation from firewood to domestic and then international timber, there can be situations where the profit limit of the domestic timber is the highest (figure 5), because of land locking or other factor increasing the costs of access to international timber. This is often the case in the tropical forests confronted to high concentrations of populations

(Java in Indonesia, RDC, parts of Brazil, etc). This doesn't mean that international timber is not profitable, but the competition between the two kinds of markets is so fierce that some mechanisms appear to "protect" the resources devoted to international markets from the domestic demand. Similarly, there are also situations where there are no real possible valorizations for neither domestic nor international timber, without scarcity problems (figure 6). This kind of economic equilibrium allows a much more important forest stock. Conversely, when the potential stock is greatly reduced if the ecologic[4] or demographic[5] conditions, the equilibrium leads to a much more limited potential stock (figure 7).

But of these local of national factors, the most influential category is certainly the substitution for other use. While the uses which extract wood or other products from the forest, do not inherently threaten the forest cover, they can lead to serious forest degradation by mismanagement if any. But when the alternative uses are economically much more interesting, given some access conditions are force of the demand, or other demographic forces, little can prevent the deforestation. Thus the remaining potential stock is greatly reduced, and limited to inaccessible places or places which prove to be unsuitable for the alternative use (figure 8).

As a policy lesson, it is interesting to note that the local and national variations are so extended, that they create many very different contexts. Therefore it is very probable that a global undifferentiated REDD policy would apply efficiently to a few niches only. The logical strategy to follow in order to give the maximum leverage power of a mitigation mechanism is rather to implement a range of declinations following the different cases.

[4] in example, in dry areas such as in Sahel) or demographic conditions (such as in the province of Bas-Congo of RDC

[5] such as in the province of Bas-Congo of RDC

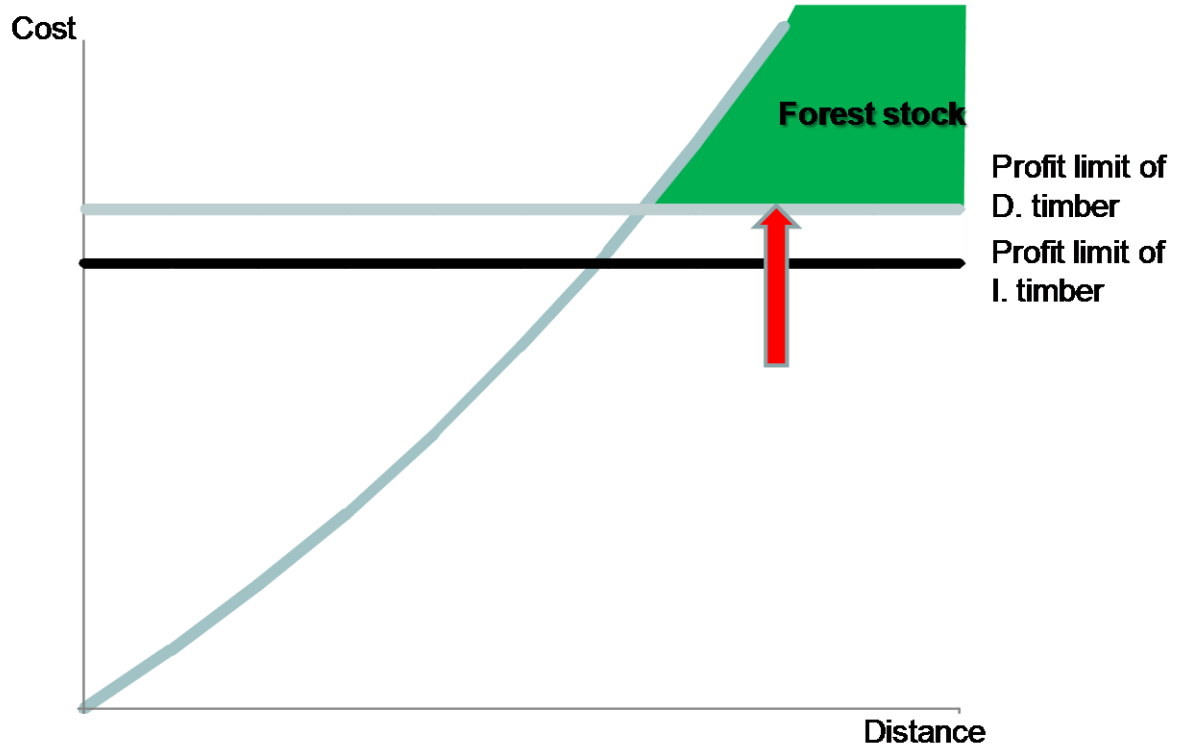

Figure 5: Economic equilibriums where the domestic timber profit limit is the highest

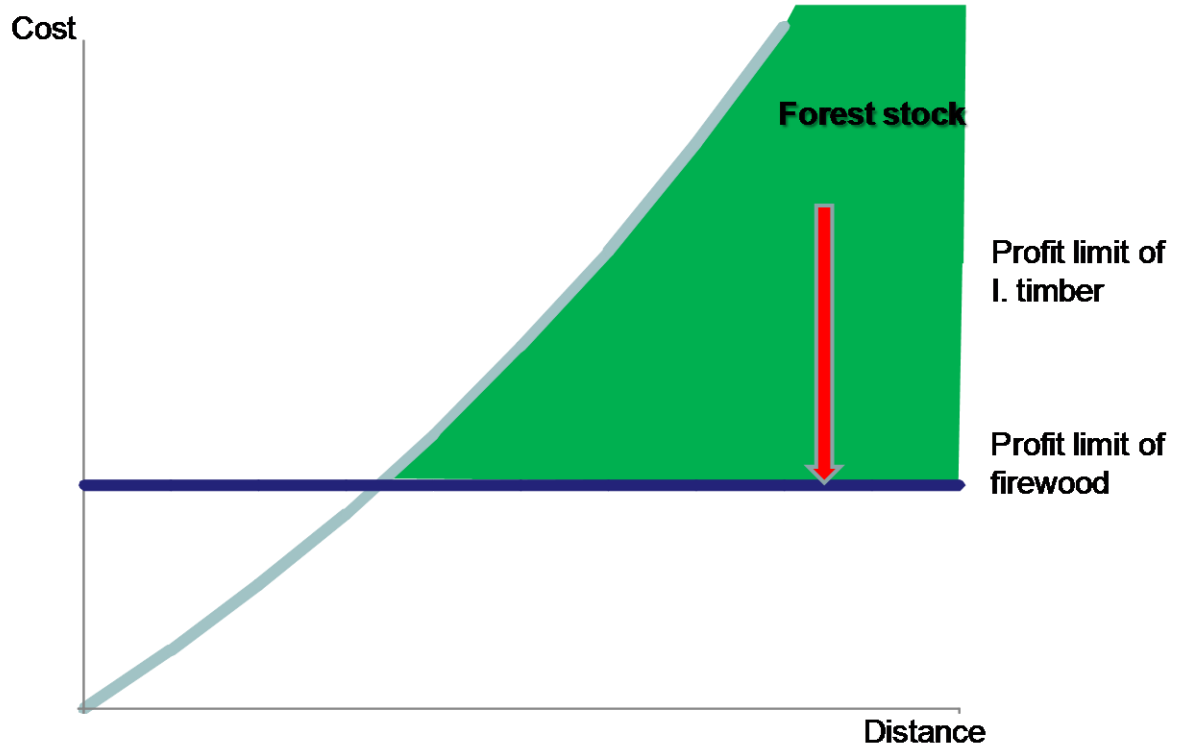

Figure 6: Economic equilibriums where the firewood profit limit is the highest, without scarcity problem

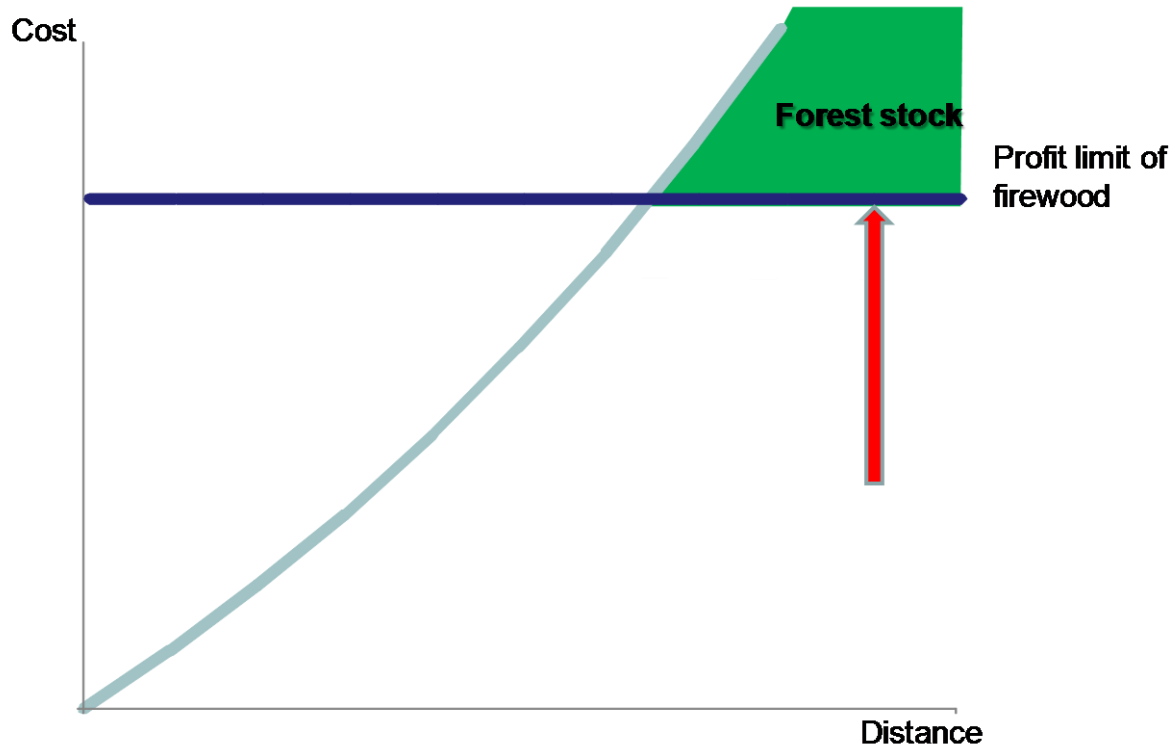

Figure 7: Economic equilibriums where the firewood profit limit is the highest, with a scarcity problem

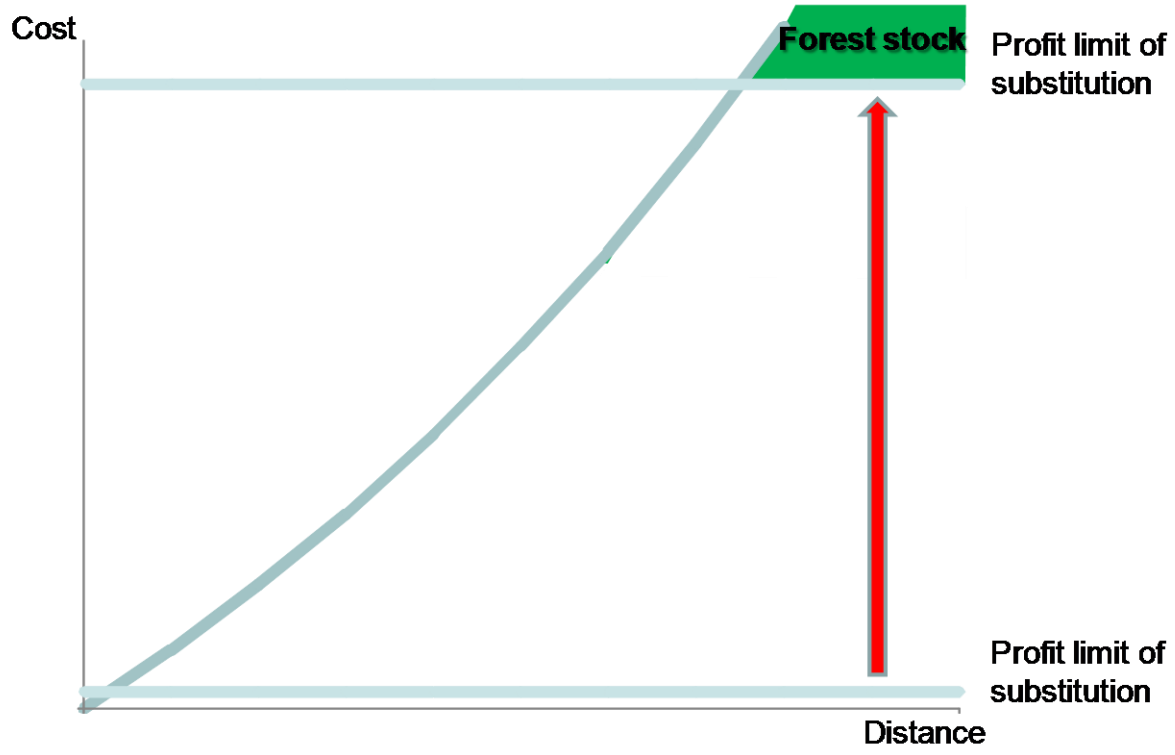

Figure 8: Economic equilibriums when alternative uses provide high economic returns, or when demographic pressure make them unavoidable

How extraction cost variations act on the economic equilibrium

These variations are very critical to the feasibility of REDD and other mitigations scenario, because they are by nature independent of the local and national variations. The latest offer little choice of action (it is not that easy to play with the ecological or demographic forces of a particular location). Conversely extraction costs can be greatly modified by local and international policies or by the evolution of global markets and other global economic factors. We will limit our discussion here to two examples which have opposite effects in terms of forest stock. Denote a specific mitigation policy or action which increases a potential forest and carbon stock by an amount equal to A (figure 9).

We have seen that the extraction costs are very dependent of the distance and transport costs. If the global price of oil suddenly increases, the extraction costs would increase accordingly. This scenario would induce a shift of the economic equilibrium towards more stock (figure 10). In such an eventuality, the potential of forest stock is considerably extended. But conversely, a decrease of the global oil price would create a shift of the curve in the opposite direction.

Similarly, a development policy aiming to improve the infrastructures (for example improving the road network) could have a negative effect on the forest stock by diminishing the transport costs. In such a case, the infrastructure improvement would cause a negative shift of the economic equilibrium towards less forest and carbon stock (figure 11) This is a paradoxical situation, where a policy which could help to mitigate the impacts of the climate change on the population by decreasing some economic costs such as transport costs, would have an adverse effect on the forest stock, because of the new economic equilibrium. In fact one can argue that this decrease of potential for forest area is the actual trend, and will happen nevertheless. Then the whole aim of a mitigation action is to create the marginal increase of stock A'' (figure 11), still better than nothing. But to be plainly effective by avoiding the negative shift, the mitigation action should be accompanied by a new set of enforcement and governance strengthening actions. Such new set of actions have a cost, which is a hidden or indirect cost of the mitigation policy.

As a policy lesson, it is worth to note that the extraction costs and the factors which influence these costs form a huge multiplier or divider effect. More broadly, the extra-sectoral influences (such as oil price, transport policies etc.) have a major impact. As such, the leverage effect of 1 dollar of international fund is very much controlled by the subsequent variations of these extra-sectoral influences.

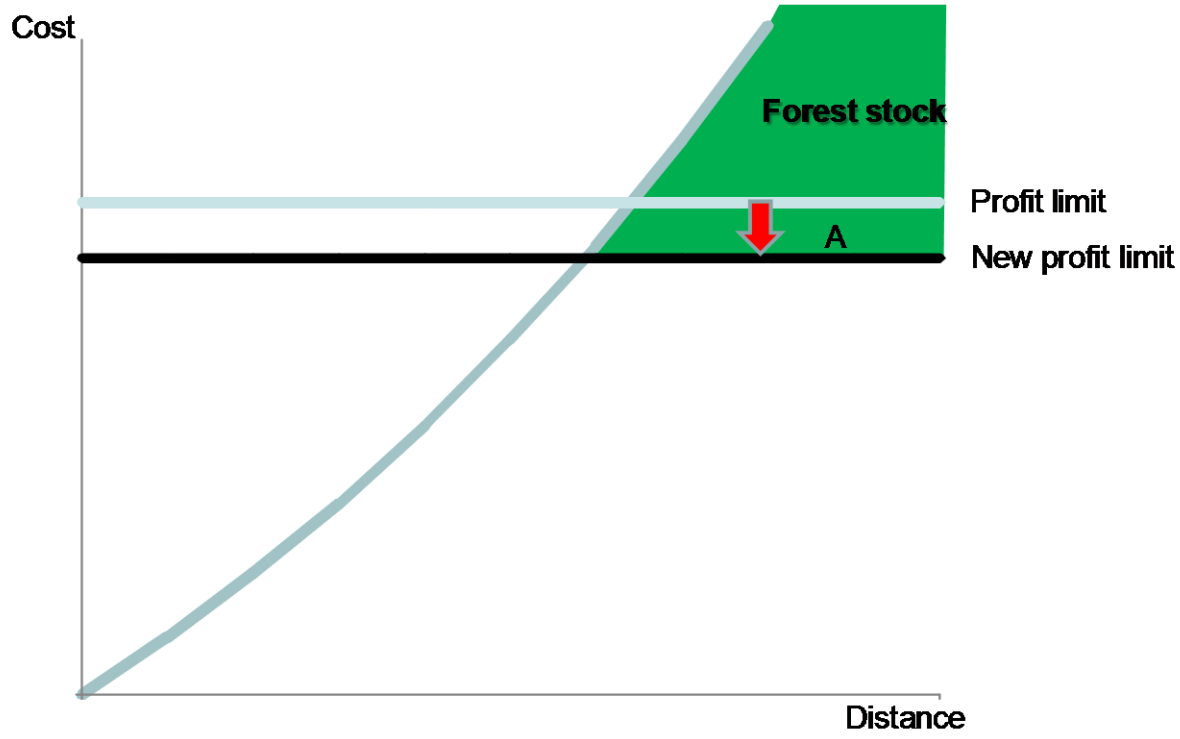

Figure 9: Increase of forest stock equal to A, after a mitigation action modifying the economic equilibrium

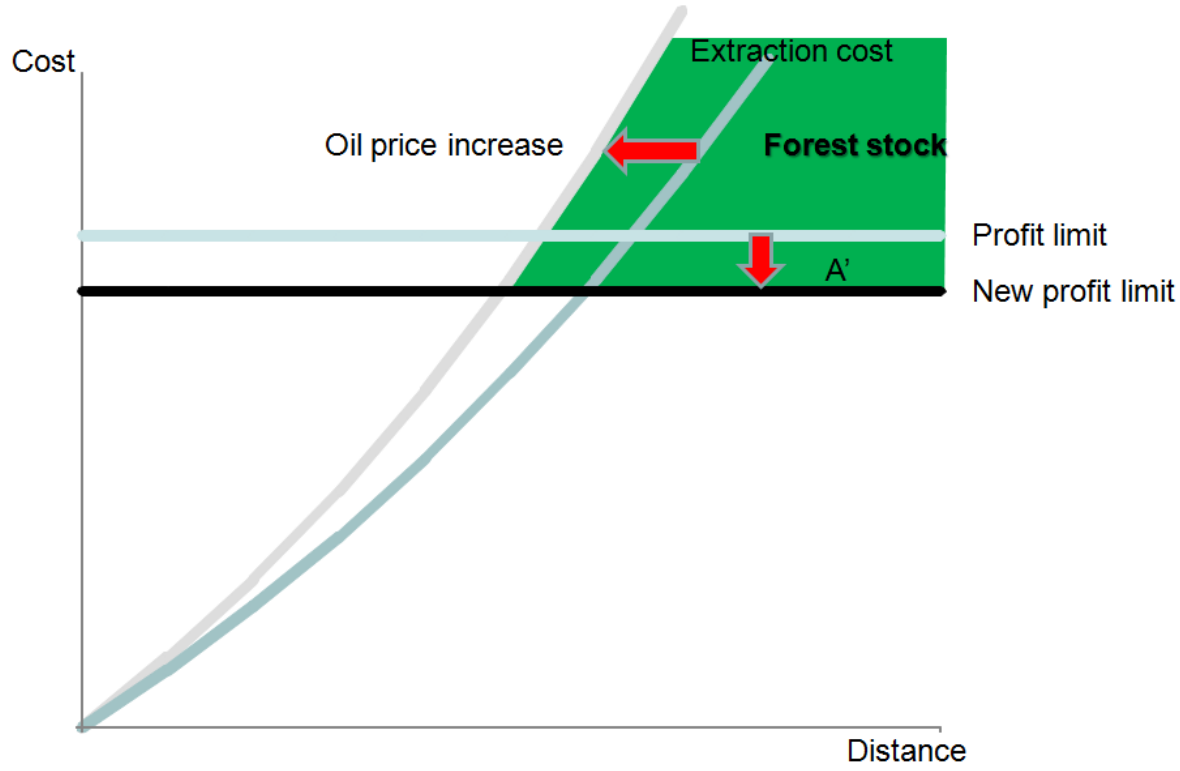

Figure 10: Effects of an oil price increase on the economic equilibrium

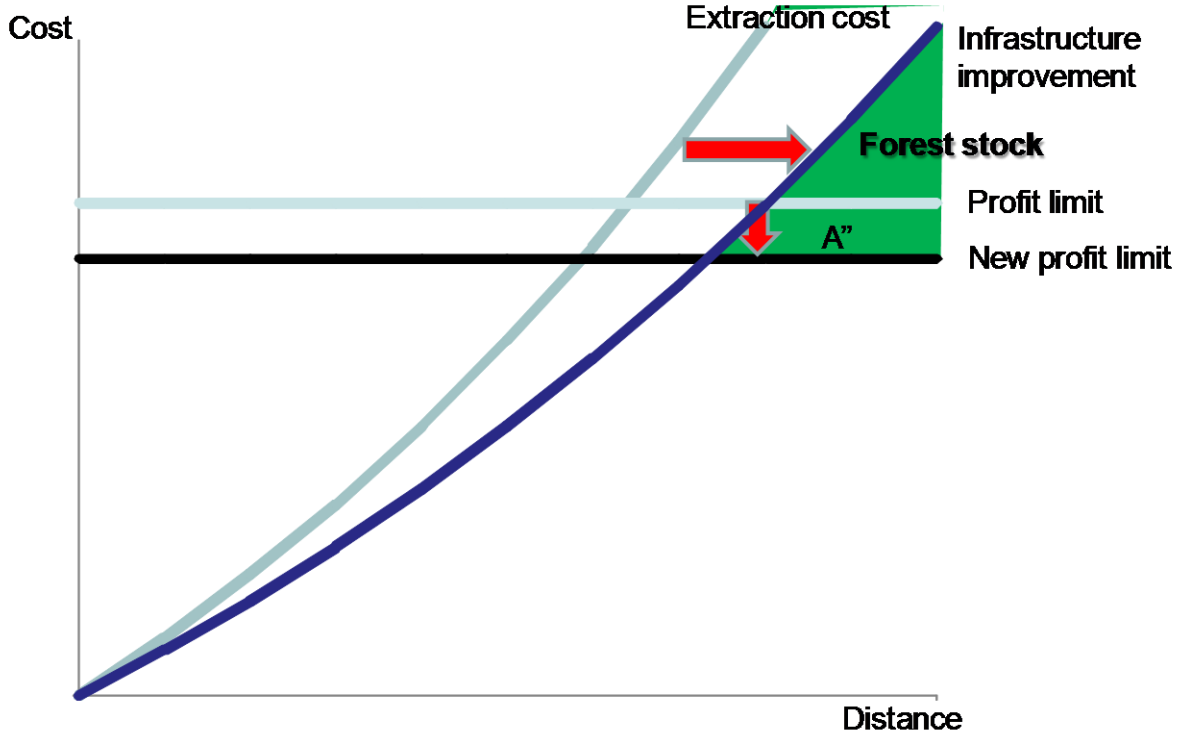

Figure 11: Effects of an infrastructure improvement on the economic equilibrium

Temptative framework for a typology

How to discriminate between the various national and local cases? A first approach can be to rank them through the main factors which previously have been discussed has influential. If we rank a few non exhaustive cases according to the distance between 1) the main markets and the forest; and 2) the population pressure on the forest, we obtain a grid with four major groups (figure 12).

Group A : relatively low population pressure, associated with limited distance or transport costs between the forests and the markets, would provide examples such as Sabah, and Sarawak[a6].

Group B: relatively low population pressure, associated with important distance or transport costs between the forests and the markets, would provide examples such as Sarawak[b7], Equateur province in RDC, Acre in Brazil.

Group C: relatively high population pressure, associated with limited distance or transport costs between the forests and the markets, would provide heteroclite examples such as Java in Indonesia, Bas-Congo in RDC, Tamil Nadu in India.

[6] Sarawak[a] represents the downstream parts of Sarawk, not far from the sea.
[7] Sarawak[b] represents upstream parts of Sarawak, with difficult access.

Group D: relatively high population pressure, associated with important distance or transport costs between the forests and the markets, would provide examples such as Kivu in RDC.

As disparate as this different cases may appear, it is possible to identify functional similarities (figure 12). For example the group B displays cases where huge areas of humid tropical forest are still marginally degraded, or even barely untouched. The forested areas are huge, therefore the changes, degradations or deforestations are low in percentage of the forest or carbon stock, but represent relatively important quantities. This means that 1 dollar of international fund impacts more on the global mitigation.

Conversely, group A and D can be put under a same one category. For different reasons, the forests are already much reduced in area or degraded in structure. Therefore, the percentage of further degradation or deforestation may seem very important, but actually concern much lower quantities of wood and carbon. This means that 1 dollar of international fund would impact less on global mitigation, but maybe would be much more significant in terms of adaptation.

In the case of group C, it is more difficult to identify common features, or to discriminate the cases, which form a very heteroclite group. We then propose to discriminate this group using a third dimension. Among the possible criteria, one could think to governance, social features, or ecological characteristics etc. (figure13). Without further detailed analysis along this line, the proposed criteria are just temptative examples. These or some other criteria could reveal themselves as more or less pertinent for a typology.

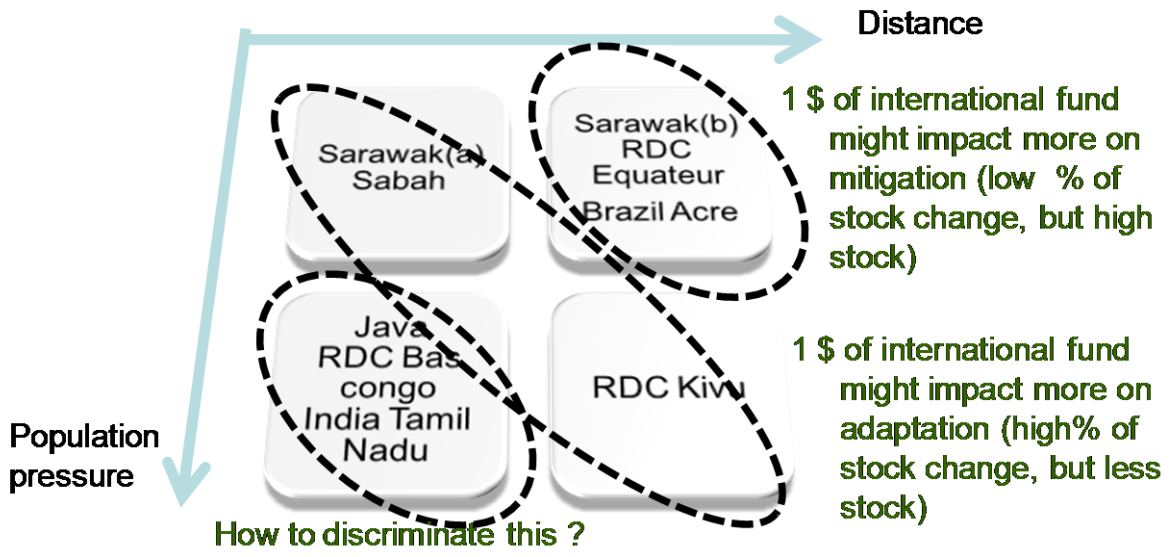

Figure 12: Distance and population criteria for a typology of forests situations regarding mitigation and adaptation mechanisms

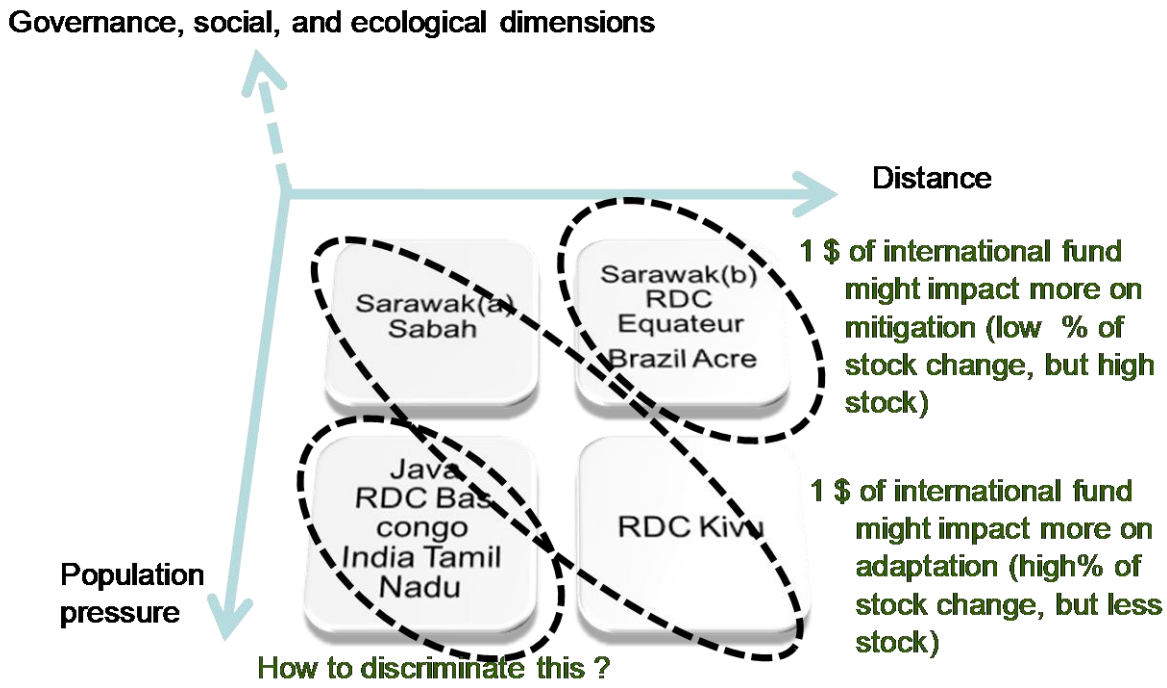

Figure 13: Possible new criteria for an improved typology of forests situations regarding mitigation and adaptation mechanisms

Conclusion

From a macroeconomic perspective, what looks like an “irresistible” growth of Chinese, Indian, Brazilian and even Indonesian demands (figure14), form a trend which challenge the idea of any REDD or other mitigation tools. It seems that the margin of action at global scale is becoming thinner and thinner. Conversely, this means that the leverage power is becoming higher through these countries.

How the international funds can evolve to trigger this leverage? What are the operational hurdles to overcome? They mainly depend on the economic feasibility of the concept. This paper has shown the extent of variation of the economic parameters which can modify the results of mitigation policies, or hinder them. This extent of variation is probably at the origin of the largely different point of views that exist among different stakeholders or scientists. One of the first operational steps towards an operationnality of the mitigation concept through forest and carbon stock would be to measure and quantify this parameters sensitiveness. This would help to define the extent and the limits of the feasibility of the concept. Another first step is to draw the map of what is possible, and what is not, and where it is. A draft typology

has been presented here, proposing a few economic parameters to be use as discriminating factors for such a typology.

Finally, regarding the implementation of such tools, many questions have yet to be answered. The limits that the concept of a mitigation policy based on the forest resources, face when confronted to the realities of the sector, raise a set of questions. Given these limits, will such policies progressively be given up, in favor to adaptation policies, probably easier to implement from a practical point of view? For example, we have seen that in some conditions, development policies (such as road improvement) have a negative impact on the stock potential. This means that most of mitigation policies may also present hidden costs, to be taken in account.

Accordingly, how corporate and industrial policies will evolve or retroact, regarding the development and the difficulties of mitigation and adaptation policies?

Figure 14: Wooden formworks for concrete building in Asia

Quick references

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